Speicher Bridge
Church Rd. over Tulpehocken Creek
North Heidelberg Vicinity
Berks County
Pennsylvania

HAER No. PA-60

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HISTORIC AMERICAN ENGINEERING RECORD

SPEICHER BRIDGE

HAER PA-60

Location:	Church Road over Tulpehocken Creek, connecting Penn and North Heidelberg Townships in Berks County, Pennsylvania.
Date of Construction:	1878
Significance:	Speicher Bridge, a rural iron highway bridge, is a good example from the important mid-19th century era of metal bridge technology.
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SPEICHER BRIDGE

The Speicher Bridge, Berks County, Pennsylvania, is a good example of the short-span highway truss bridges built in many American communities during the late 19th century. Its construction occurred toward the end of the 1850-1880 "formative period of American metal bridge construction." [1] The local conditions responsible for its erection reflect the social milieu in which a need for such bridges evolved. Late 19th-century bridge and shipbuilding tycoon Henry G. Morse's association with this bridge adds to its importance.

THE MILIEU

Speicher Bridge connects North Heidelberg township with Penn Township. In 1878 both townships were prosperous Pennsylvania Dutch farming neighborhoods. North Heidelberg particularly needed a connection to the main road to Reading which traversed Penn Township on Penn's side of Tulpehocken Creek. As a "strictly agricultural township" [2] lacking towns and including "one of the county's sparsely-populated areas," [3] the area needed, by the 1870's, improved highway connections because the Union Canal, its former highway, was "rapidly falling into disuse." [4]

Penn Township, located on the east side of Tulpehocken Creek, was also rural and losing a commercial artery with the failure of the Canal. Fortunately, the main road northwest from Reading, 1976's Route 183, bisected the township. Nevertheless, residents stood to benefit from a good highway connection with the neighboring township. For example, customers visiting mills, stores, and taverns in Mt. Pleasant and vicinity could avoid the inconvenience of fording the Tulpehocken or traveling to more distant bridges.

Therefore area residents petitioned Berks County Commissioners to erect a bridge at the site of Speicher's Ford. [5] Accordingly, "viewers" were appointed during the winter of 1877-1878 to report to the Court of Quarter Sessions on the advisability of a county-built bridge at the ford. [6] The viewers recommended a bridge, and the court approved their report.

Berks County Commissioners Henry W. Smith, William Davidheiser, and William G. Moore moved quickly. On February 18, 1878, they "resolved to obtain the probable cost" [7] of a bridge. They also promised to decide for or against erection "as soon as the probable cost can be ascertained." [8]

Apparently probable costs pleased the Commissioners. By April 15, 1878, Morse Bridge Company of Youngstown, Ohio, had received a contract for construction of an iron bridge at Speicher's Ford. Marlsberger and

Company submitted the low bid for the substructure. [9]

The Morse Company agreed to provide two 100x18-foot spans for $15.35 per lineal foot or $2,916.50. Marlsberger and Company pledged to build the pier and two abutments for $2,381.10. [10]

Construction proceeded during the spring, summer, and fall of 1878. By the end of June the pier and abutments were completed and approved by H. C. Zacharias, Berks County Surveyor. [11] Reading's Daily Eagle noted completion of the superstructure on 29 October 1878. Apparently there were no serious difficulties.

Before "ordering the iron," the Morse Company attempted to persuade the Commissioners to change the contract from two spans to "two spans continuous over the pier." [12] Henry G. Morse's accompanying sketch suggested the top chords of the two spans were to be attached to a post to be anchored to the pier. The bridge's six panels would each then feature diagonals and counter-diagonals. Mr. Morse argued the change merited $250.00 above the original contract because "on a bridge lacking a sidewalk," horses were frightened at the space between the end posts of the spans. In any event, the change improved the bridge's appearance and "completeness." Morse argued further that purchasers of "all our two and three span" bridges had changed to the proposed style. The Commissioners rejected the proposition and ordered the bridge completed as ordered. They approved the finished bridge six weeks after completion, on December 5, 1878. [13]

Meanwhile, the Court honored Penn Township's citizens' request that viewers be appointed to formally recommend a road change to accommodate Speicher Bridge. [14] Apparently rsidents forded the Tulpehocken to the north near David Staudt's gristmill. Viewers were "to vacate about 250 feet of the public road" there and "lay out another road to lead to the bridge." [15]

THE BRIDGE

Unfortunatly, both company and Berks County specifications for Speicher Bridge have disappeared. Its importance in 1976 is the survival for nearly a century of a wrought-iron highway bridge from the period in which building such bridges evolved from an "empirical art to a scientific technique." [16] It would be valuable indeed to know if the Morse Bridge Company employed such aspects of this technology as theoretical stress analysis, testing of full-scale members, or metallurgical analysis. [17] The bridge's appearance and descriptions of the Morse Bridge Company suggest it did.

For their two 100x18-foot spans, Morse designers chose a simplified Pratt truss in which the ties or diagonals were reduced to a single one in the direction of tension, except for the center panel, in

which a counter-diagonal was added. The rolled shapes used on the bridge reflect post-Civil War improvements and "increases in the production of wrought iron." [17] The "much lower prices" for such iron presumably enabled Morse Bridge Company to offer a structure at a price which convinced Berks County Commissioners to build in iron rather than wood.

The Speicher Bridge is also typical of its era in American metal bridges in using pinned connections. [18] This permitted erection "with a minimum amount of equipment" and "the use of unskilled labor." "All in all," it simply "cost less than fully riveted work." [19]

The Speicher Bridge also indicates that the Morse Bridge Company tried to employ other contemporary advances in truss construction. The superstructure shows use of members with integrally cast joint details. The number of joints could thereby be reduced and faster fabrication and erection achieved.

The truss employs plates and shapes riveted together to form individual members, which indicates that the Morse Company used testing facilities developed after 1850. Such devices meant Morse engineers could confidently design specifications and formulae for the Speicher Bridge. [20]

The bridge provides a good example of the use of a "nest" of roller bearings where each span meets the abutments. Devised by the designers of the earliest metal bridges, these roller plates were supposed to allow the bridge to respond to forces causing expansion and contraction. [21] The Morse Company's roller assembly is typical of the era in its smaller diameter rollers, which experience demonstrated usually "failed to perform their intended function after a relatively short period." [22] Such assemblies were also usually overlooked during inspection and given little maintenance. As a result, most nests were usually clogged with debris and frozen in position. The Speicher Bridge received little maintenance, and its rollers appear to be both clogged and fixed into position. [23]

HENRY G. MORSE AND THE MORSE BRIDGE COMPANY

The Speicher Bridge brought Berks County in contact with Henry G. Morse (1850-1903), an important late 19th-century businessman. Morse and his brother, C. J. Morse, formed their firm in January 1878. [24] Thus the firm was in business only a few weeks before receiving the Berks County contract.

The company employed 100 workers to fabricate "all classes of iron bridges, roofs, and boilers." [25] A contemporary noted large derricks by which "the heaviest bridge girders" were loaded for shipment on one of the two railroads serving the plant "by which they ship direct by

every railroad" entering Youngstown. [26]

This description placed Morse Bridge Company in the company of typical mid-19th-century metal bridge building firms formed to build the first generation of metal bridges. The virtue such firms possessed for customers such as the Berks County Commissioners was that they were "equipped to execute a complete construction job." [27] The county could expect Morse to produce "a finished bridge ready for traffic." [28]

In 1878, 28-year-old Henry G. Morse was in the early years of an important career. [29] He had graduated from Rensselaer Institute of Technology in 1871 as a Civil Engineer. From that time until 1873 he worked for the Pennsylvania Railroad. For the next four years he was an engineer for the Wrought Iron Bridge Company, Canton, Ohio. This training placed him in the company of experienced engineers who rapidly mastered or improved metal bridge design between 1850 and 1880. [30]

Nine years later, in 1887, Morse left his Youngstown firm to become president of Wilmington, Delaware's Edgemoor Bridge Works. In 1896 he began a brief two-year tenure as president of the Harlan and Hollingsworth shipbuilding firm in Wilmington. Perhaps his most important activities occurred between 1896 and his premature 1903 death in J. P. Morgan's office. Contemporaries believed he left Harlan and Hollingsworth despite "reorganizing it and placing it on a successful basis" because of "a difficulty" over his stock demands. He resolved to form his own company to build "the most modern shipbuilding plant in the world."

Morse succeeded. He built in Camden, New Jersey, a shipyard the author of his obituary termed "the finest shipbuilding plant in existence." That claim is difficult to evaluate, but the firm was important enough to be "a thorn in the flesh of the new shipping combine." Morse's aggressiveness and quality workmanship were graphically illustrated shortly before his death. He successfully lobbied with the White House and Navy Department to give him a contract for two cruisers originally awarded to William Cramp and Sons Ship and Engine Company. Morse persuaded President Roosevelt his bids were lower, "all things considered."

Apparently he planned to build a completely integrated shipbuilding plant similar to the type of installation Ford later created at the Rouge plant. He hoped to become "entirely independent" of outside suppliers. His contemporaries feared the facility Morse planned; the "shipbuilders" pool offered him $50,000 to refuse to bid on a job. Morse's fatal stroke occurred in Morgan's office because the financier was in 1903 seeking an "alliance" between Morse and other shipbuilding firms.

Morse's early death probably robbed him of a major role in early

20th-century business history. As it was, his career reflected themes prominent in late 19th-century American business history. He deserves more study than he has received.

For Berks County, Pennsylvania, Morse's importance was that he provided its citizens an "ordinary iron highway bridge." [31] The Speicher Bridge incorporated most of the advances metal bridge technology experienced during the mid-19th century. This product of the young engineer's shop served residents for almost a century.

Footnotes

1. Llewellyn Nathaniel Edwards, A Record of History and Evolution of Early American Bridges (Orono, Maine: University Press, 1959), p. 102.

2. Nick Moser, "North Heidelberg Township," Reading Sunday Eagle Magazine, September 1, 1957, p. 1.

3. Ibid.

4. Reading Daily Eagle, March 7, 1878, p. 1.

5. Ibid., and Berks County, Pennsylvania, Commissioner's Minutes, February 18, 1878.

6. Reading Daily Eagle, March 7, 1878, p. 1.

7. Berks County, Pennsylvania, Commissioner's Minutes, February 18, 1878.

8. Ibid.

9. Berks County, Pennsylvania, Commissioner's Minutes, April 15, 1878.

10. Ibid., July 1, 1878. Surprisingly, there is no evidence of either competitive bidding or specifications from various companies. If such materials existed they have disappeared by 1976. This is particularly unfortunate because Berks County purchased the Speicher Bridge toward the end of the period during which companies building iron bridges held patents or paid royalties to patentees on various trusses (Lewellyn Nathanial Edwards, A Record of History and Evolution of Early American Bridges, p. 98). As a result, competitors appeared "as advocates for their special truss" instead of "competitors upon any definite specifications" (Ibid., p. 99). Unfortunately, neither Berks County nor Morse Bridge Company records survive to provide an example of this phenomenon.

11. Berks County Commissioner's Minutes, July 1, 1878.

12. Ibid., May 27, 1878.

13. Ibid, December 2, 1878. It is assumed the inspection the Commissioners announced for three days after 2 December occurred.

14. Reading Daily Eagle, October 30, 1878, p. 1.

15. Ibid.

16. Carl W. Condit, American Building Art, the Nineteenth Century (New York: Oxford University Press, 1960), p. 139.

17. Edwards, Early American Bridges, p. 98.

18. Ibid., p. 101.

19. Ibid., p. 104.

20. Ibid., p. 111.

21. Ibid., p. 118.

22. Ibid.

23. This comment is based on visual inspection and the lack of maintenance noted in Berks County, Pennsylvania, Record of Bridges.

24. Youngstown, Ohio, Directory, 1880-1881.

25. Ibid.

26. Ibid.

27. Edwards, Early American Bridges, p. 101.

28. Ibid.

29. Youngstown, Ohio, Vindicator, 1903. All material about Henry G. Morse is from this obituary.

30. Edwards, Early American Bridges, p. 101.

31. The quoted phrase is from the title of the contemporary volume, John Alexander Low Waddell, The Designing of Ordinary Iron Highway Bridges (New York: John Wiley and Sons, 1884).

Bibliography

Black, Archibald. The Story of Bridges. New York: Whittlesey House (McGraw Hill), 1936.

This is a general survey. The title is accurate although examples are exclusively European and American. Few important individual bridges are analyzed. The volume is still a good general introduction although it is now somewhat out of date.

Berks County, Pennsylvania, Commissioner's Minutes.

This paper used the bound volume covering 1884. Late 19th-century Commissioner's Minutes were apparently bound when enough handwritten minutes existed to make a sizeable volume. The minutes are not paginated or indexed. Fortunately, the Commissioners followed a rough schedule of topics, which reduced search time. Minutes are currently kept in the office of Mrs. Engle, Clerk to the current Commissioners.

Berks County, Pennsylvania, Record of Bridges.

This is one bound volume begun by J. J. Eshelman, Bridge Inspector between 1906 and 1908. His successors maintained entries through World War I. Entries describe Berks County bridges in existence at the time the volume was compiled. Notations are skimpy. Bridges are briefly described and maintenance performed on them through the 'teens is noted. Unfortunately, this is the extent of evidence for older Berks County bridges. Contracts, specifications, and the like stop with 1931.

Condit, Carl W. American Building Art, the Nineteenth Century. New York: Oxford University Press, 1960.

A well-written recent basic volume. Through it the student can appreciate the larger story of which the Speicher Bridge is a part.

Edwards, Llewellyn Nathaniel. A Record of History and Evolution of Early American Bridges. Orono, Maine: University Press, 1959.

This is an important book. It discusses in considerable detail American bridge technology through the early 20th century. Mr. Edwards was a practicing bridge engineer during the first half of the 20th century. The reader profits from his experience. The book emphasizes the modest structures of which the Speicher is an example. Unfortunately, the volume is marred by dull writing. It was posthumously prepared by Edward's associates.

Greene, Charles E. Graphical Method for the Analysis of Bridge Trusses Extended to Continuous Girders and Draw Spans. New York: Van Nostrand, 1875.

A contemporary technical manual emphasizing "stress on trusses continuous over piers and on pivot or drawbridges." The volume is important to appreciate the state of the art at the time of the formation of firms such as the Morse Bridge Company.

Reading Daily Eagle. Various articles, January to December, 1878.

Reading's major late 19th-century daily is a basic source. It is not indexed. Complete runs on microfilm are held by the newspaper's library and the Reading Public Library.

Tyrrell, Henry Grattan. History of Bridge Engineering. Chicago: By the Author, Chicago, Illinois, 1911.

This useful survey covers its subject through the early 20th century. It is thin on specific construction techniques and definition of terms. Its strength is organization. Individual chapters are devoted to different types of bridges. These sections feature sketches or photographs of numerous examples.

Waddell, John Alexander Low. The Designing of Ordinary Iron Highway Bridges. New York: John Wiley and Sons, 1884.

Waddell's contemporary volume links the technology of the day to a site such as the Speicher Bridge. He hoped to relay technical data to an interested but uninformed group such as the Berks County Commissioners. He succeeded; his book is a link between highly specialized volumes and general surveys of bridges. The detailed drawings and glossary of terms must be consulted by students of late 19th-century metal bridges.